DEPARTMENT OF THE INTERIOR, CANADA
Hon. Frank Oliver, Minister; W. W. Cory, Deputy Minister
FORESTRY BRANCH—BULLETIN No. 19
R. H. Campbell, Superintendent of Forestry

FOREST PRODUCTS OF CANADA

1909

TIGHT AND SLACK COOPERAGE BOXES AND BOX SHOOKS

COMPILED BY
H. R. MacMILLAN, B.S.A., M.F.
Assistant Inspector of Forest Reserves

OTTAWA
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TIGHT AND SLACK COOPERAGE, 1909.

The information as to the amount of cooperage stock manufactured in Canada in 1909 is based upon reports received from 128 firms. The total value of the cooperage stock manufactured in Canada in 1909 was $1,842,235; the value of the tight cooperage stock amounted to $247,116 or 13·4 per cent of the total; the remainder, $1,595,119, or 86·6 per cent of the total, represents the value of the slack cooperage stock.

TIGHT COOPERAGE.

The tight cooperage industry, the making of barrels for the containing of liquids, reaches but small proportions in Canada. The large users of tight cooperage, the shippers of whisky, beer, ale, wines and oils, import from the United States either their barrels, their staves and heading, or the logs from which to make this stock. The reason for this is that there are in the forests of Canada no oak, the only wood yet found to be suitable for the manufacture of the high grade tight cooperage required for the handling of these products for which in Canada are used the largest quantities of tight cooperage.

Table I, which shows the quantity and value of tight cooperage manufactured from different kinds of wood in 1909, represents only what was manufactured in Canada and takes no account of the large quantities of barrels, kegs and staves, chiefly of white and red oak, which were during the year imported from the United States.

TABLE I.

Tight Cooperage, 1909—Total Quantity, Total Value and Average Value by Species and Classes, of the tight staves manufactured in Canada, 1909.

Kind of Wood.	SAWED.			ALE AND BEER.			BUCKED AND SPLIT.		
	Quantity — thousands	Value.	Average Value per 1,000	Quantity — thousands	Value.	Average Value per 1,000	Quantity — thousands	Value.	Average Value per 1,000
		$	$ c.		$	$ c.		$	$ c.
Elm (1)	5,499	62,152	11 48						
Oak	1,628	57,715	35 45	132	9,655	73 14	545	47,351	
Spruce	560	5,383	9 61						
Douglas Fir	356	6,147	17 27						
Basswood	217	3,476	16 02						
Ash	74	1,325	17 91						
Cedar	60	5,000	83 33						
Total	8,394	142,198	16 94	132	9,655	73 14	545	47,351	

(1) From both imported and domestic logs.

The striking point in Table I is that the tight cooperage manufactured in Canada is, both as regards the class of product and the species of wood used, not high grade. Only 1·5 per cent of the tight staves manufactured in Canada are ale and beer stock, a class of goods requiring straight grained white oak free from knots. Such oak is

not now to be had in Canada; consequently the large quantity of ale and beer stock used in Canada is imported from the United States. Similarly, the other class of staves requiring a high grade of oak timber, the 'bucked and split,' constitutes only 6 per cent of the total. The great bulk of the tight staves manufactured in Canada are sawed; in 1909, out of a total of 9,071,000 tight staves, 8,394,000, or 92·5 per cent, were sawed. The relative quality of the different classes of staves is shown by a comparison of the average price per thousand; in 1909 sawed staves were $16.91, ale and beer staves were $73.14 and bucked and split staves were $86.88.

The great preponderance of the sawed tight staves and their low average price as compared with the other classes is explained by a study of the species used. It has already been explained that oak, and chiefly white oak, is the only timber suitable for the manufacture of ale and beer and bucked and split staves, that there is practically no oak in Canada, and that consequently these classes of staves are imported from the United States. On the other hand, Table I shows that eight species of wood were in 1909 used in Canada for the manufacture of sawed tight staves. The two chief woods are elm and oak, which constitute respectively 63·5 per cent and 19·4 per cent of the total quantity of sawed staves; the other woods, with the percentage they represent, are: Spruce, 6·6 per cent; Douglas fir, 4·2 per cent; basswood, 2·6 per cent; ash, 0·9 per cent; and cedar, 0·8 per cent.

Though sawed oak barrels are used almost exclusively[1] for the handling of alcoholic liquors and oils, trades which require by far the greater part of the tight cooperage used in Canada, oak, including imported oak, stands second on the list of tight cooperage woods, and represents less than one-fifth of the total. Nearly four-fifths of the tight staves used in Canada are imported in a manufactured state; the remaining one-fifth is manufactured in Canada from white and red oak, most of which is imported, part of which is picked up from farmers' wood lots, chiefly in southern Ontario.

The tight cooperage plants turning out high grade material are not situated in certain forest districts in Canada where raw material abounds, as is the case in the United States, but are managed by or closely allied to the large breweries, distilleries and refineries using their product. Varying with their convenience the breweries, distilleries and refineries of Canada import their barrels or staves already manufactured or import the logs and manufacture them;[2] many of the tight cooperage plants in Canada using oak and supplying the high class trade are only assembling and repair shops; others are factories dependent upon foreign logs; a very few quite small manufacturers still manage to secure enough oak timber to supply them. Owing to the disappearance of native oak timber the number of the latter is decreasing.

The tight cooperage manufacturing industry in Canada, not having any native supplies of a perfect tight cooperage wood at its disposal, is chiefly concerned with supplying barrels for the shipment of rougher commodities, such as fish, pork and other packing house products, syrup, molasses and glucose. For the handling of these materials, which are not so easily tainted as alcohols and which are not so penetrating as alcohols or oils, tightly jointed barrels of elm, spruce, Douglas fir, basswood and ash are suitable.

Though these woods are used somewhat indiscriminately for the different uses to which low grade tight cooperage is put in Canada, there are special uses in which certain woods have come to be used to a greater extent than others. On the Atlantic coast large quantities of spruce, and on the Pacific coast large quantities of Douglas fir, are used in the manufacture of fish barrels and salmon tierces. Douglas fir is manufactured into tallow casks and exported to Australia. Elm contributes to all classes of cheap tight cooperage, but, with basswood, is used especially for syrup barrels. Ash goes chiefly to the packing house trade.

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[1] Some imported red gum is now used for barrels containing heavy oils.

[2] There were imported into Canada in 1909, 101,818 tight barrels, valued at $117,667, and 4,919,000 oak staves and heading, valued at $174,346—a total tight cooperage import worth $292,013.

Breweries report the use of Douglas fir and cedar for vats and tanks. The high average price of the cedar staves manufactured, $83.33 per thousand, would indicate that they were for such tanks.

The quantity and value of the tight heading manufactured is given in Table II.

TABLE II.

Tight Cooperage, 1909—Total Quantity, Total Value and Average Value by Classes, of the Tight Heading manufactured in Canada, 1909

Class.	Quantity. (Sets)	Value.	Average Value (per Set)
		$	c.
Sawed	413,764	42,356	10
Ale and beer (1)	11,250	5,556	49
Total	425,014	47,912	11

(1) This heading is all White Oak, chiefly from imported logs.

TABLE II.

Here it is shown that sawed heading predominates just as do sawed staves; 97·4 per cent of the heading manufactured in Canada is sawed. 2·6 per cent is ale and beer. Oak alone is used for the ale and beer heading, and the price, 49 cents per set, is consequently nearly five times as great as the sawed heading, for which elm, spruce, Douglas fir, basswood and ash are used.

The annual manufactures of tight cooperage in the United States are 38 times greater and 58 times more valuable than those of Canada. The United States exports high grade tight cooperage. Canada imports it. The United States owes its control of the tight cooperage on this continent to its large hardwood forests; so superior in this respect is the composition of the United States that while, even including imported logs, oak constitutes only 55·5 per cent of Canada's small tight cooperage output, it furnishes 87·2 per cent of the tight staves manufactured in the United States.

SLACK COOPERAGE.

As there is a greater demand in Canada for slack cooperage than for tight cooperage, and as Canadian woods are better adapted for slack than tight cooperage, the manufacturing of slack cooperage stock is by far the greater part of the Canadian cooperage industry. There were manufactured in Canada during 1909 103,982,000 slack staves, valued at $809,649; 8,310,000 sets of slack heading, valued at $432,343; and 35,771,000 hoops, valued at $353,127; a total of $1,595,119 for the slack cooperage industry.

Details are given in Table III of the quantity and value of the different species of wood used for staves, heading and hoops.

Table III.

Slack Cooperage, 1909—Total Quantity, Total and Average Value of the Staves, Heading and Hoops manufactured in Canada, 1909, by species.

Kind of Wood.	Staves.			Heading.			Hoops.		
	Quantity — thousands	Value.	Average Value per 1,000	Quantity — thousands	Value.	Average Value per 1,000	Quantity — thousands	Value.	Average Value per 1,000
		$	$ c.		$	$ c.		$	$ c.
Elm	66,586	563,198	8 46	2,267	97,983	42 65	29,327	294,224	10 03
Spruce	17,106	99,566	5 82	1,590	48,786	30 68	1,360	8,078	5 94
Poplar	6,350	46,210	7 28	2,568	179,760	70 00	.....	.....	.....
Maple	4,886	29,768	6 09	100	5,000	50 00	1,500	15,000	10 00
Birch and beech	4,850	29,194	6 00	8	480	60 00	1,749	17,490	10 00
Basswood	1,609	17,332	10 83	1,747	100,331	57 43	1,835	18,355	9 99
Ash	1,584	10,401	6 57	.....	.....	.....	.....	.....	.....
Cottonwood	810	12,820	15 83	.....	.....	.....	.....	.....	.....
Balsam	200	1,160	5 80	.....	.....	.....	.....	.....	.....
Total	103,982	809,649	7 78	8,310	432,343	52 03	35,771	353,127	9 87

Table III.

Ten species of wood were used in the manufacture of slack staves in 1909. Two species, elm and spruce, furnished over four-fifths of the total; 64 per cent of the staves were elm and 16·5 per cent were spruce. Poplar furnished 6·1 per cent of the staves manufactured, and the other species used—maple, birch, beech, basswood, ash, cottonwood and balsam—furnished each less than 5 per cent of the total.

Excluding cottonwood, of which a comparatively small quantity manufactured in British Columbia brought the high price of $15.83 per thousand, basswood and elm staves at 10.83 and $8.46 per thousand were the most valuable. Staves of other species varied in price from $7.28 to $5.80 per thousand, with spruce and balsam the cheapest at about $5.80. One reason for the low price of spruce is that it is the wood chiefly used for nail kegs and the roughest class of cooperage. The higher price of basswood and elm and poplar is due to the superior qualities of the cooperage manufactured from these woods and to their general use in the higher class of cooperage used for flour and sugar barrels.

The decrease in the quantity of basswood and the extension of the slack cooperage industry into districts where basswood is not to be found, but where poplar is abundant, has given poplar first place in the manufacture of heading. Poplar is good heading material and is destined to replace basswood for this purpose in Canada. It is now used largely for flour barrels. Nearly one-third of the heading manufactured in 1909 was poplar; poplar and elm together furnished over one-half; about one-fifth was basswood and one-fifth spruce. The percentage manufactured of each of the leading species used was: Poplar, 30·9 per cent; elm, 27·7 per cent; basswood, 21·2 per cent; spruce, 19·1 per cent.

Of the four species furnishing the bulk of the heading, spruce and elm bring the lowest prices at $30.68 and $42.65 per thousand sets, while basswood and poplar sell to the best advantage at $57.43 and $70 per thousand sets.

Though metal and wire hoops are being increasingly used with slack cooperage, wooden hoops are still turned out in a quantity proportionate to the staves and head-

ing manufactured. Elm is the chief wood used for hoops in Canada; there were 29,327,000 elm hoops manufactured in 1909; this was 81·9 per cent of the entire output; the other species used—basswood, birch and beech, maple and spruce—divided almost equally the remaining 18·1 per cent.

Hoops of all species, excepting spruce, sold for about $10 per thousand; spruce hoops averaged only $5.94 per thousand, the price being kept down both by the poor quality of the material used for this purpose and by the use of spruce for nail kegs.

Three classes of manufacturers produce the slack cooperage of Canada. The smallest and most numerous are the individual coopers, chiefly located in the apple regions of Ontario, Quebec and Nova Scotia, who cater only to the local demand. Frequently these men carry on a cooperage business in connection with a small sawmill. Another class of slack cooperage manufacturers comprises the large shippers, chiefly of flour, who maintain private cooperage plants. The third class, manufacturing the greater part of the slack cooperage used in Canada, comprises the large cooperage factories. These factories are located with reference both to the supply of hardwood timber and to the market for barrels, and are nearly all situated in the hardwood regions of the eastern provinces, chiefly Ontario. Reports from these factories indicate that they are finding it increasingly difficult to find timber; that those which do not close down permanently are forced to move to new locations to secure raw material. As the farmers' wood lots become exhausted, the general trend of the slack cooperage industry is to move farther north, where large supplies of poplar, spruce, maple and birch may be found.

Most of the slack barrels used in Canada are of domestic manufacture. The chief imports are of hoops, together with small quantities of gum and sycamore for flour barrel staves.

Considered on a per capita basis, the annual slack cooperage output of Canada is greater and more valuable than that of the United States. Slack cooperage is, nevertheless, dearer in Canada than in the United States; the United States prices per thousand were for 1908: Staves, $5.72; heading, $45.71; hoops, $6.91. The prices in Canada during 1909 were: staves, $7.78; heading, $52.03; hoops, $9.87. Nineteen woods are used for staves in the United States; five of these—red gum, pine, elm, beech and maple—furnish each more staves annually than are cut in the whole of Canada. Though pine is the second most important slack cooperage wood in the United States, it was not reported for 1909 by any Canadian cooperage firm.

Slack cooperage can profitably be manufactured from sawmill waste, and it would be a great saving of timber if this practice became general. This method of utilizing all the timber and reducing the cost is finding favour in the United States. There are yet but few signs of it in Canada.

BOXES AND BOX SHOOKS MANUFACTURED, 1909

The figures given in this report represent about 60 per cent of the quantity of lumber used during 1909 by the box manufacturers of Canada, but do not include the large quantities used by the shippers of stoves, machinery, furniture, musical instruments, carriages, implements, plate glass, veneer and stone. Those who ship bulky articles varying so much in size and shape as those named above find it more profitable to manufacture their own crates and packages.

The reported consumption of lumber for boxes and shooks for the whole of Canada in 1909 was 82,972,000 feet, valued at $1,264,376. In Table I is a detailed statement of the number of mills in each province, the total quantity and percentage of the lumber used in each province, as well as its total and average value.

TABLE I.

Boxes and Box Shooks, 1909—Number of reporting shook mills, Quantity and Value of Lumber used, per cent distribution and average Value by provinces.

Province	Number of box and shook factories.	Lumber Used.		Value of Lumber.	
		Quantity M. Feet B.M.	Per Cent Distribution	Total Value.	Average Value per M.
Quebec	22	34,450	41·5	544,854	15·82
Ontario	25	25,100	30·3	388,259	15·47
British Columbia	3	9,017	10·9	147,722	16·38
Manitoba	1	6,752	8·1	95,820	14·19
New Brunswick	5	5,900	7·1	69,225	11·73
Nova Scotia	4	1,753	2·1	18,496	10·55
Canada	60	82,972	100	1,264,376	15·24

As boxes and box shooks are commodities that will not bear much expense for freight, it is natural to find that nearly three-quarters of the lumber consumption for boxes is reported from Ontario and Quebec, the two provinces in which are centred chiefly the manufacturing and shipping interests of Canada. Were the statistics for the box industry as complete for 1909 as those for other industries, a still larger proportion of the lumber consumed would have been shown to have been used in Ontario and Quebec, and Ontario, not Quebec, would be shown at the head of the list. There are still a large number of factories, in Ontario especially, and in Quebec from which no reports are secured. Allowing for the amount of lumber used by factories not reporting, it is probable that about 140,000,000 feet of lumber, worth about $2,100,000, is used annually for the manufacture of boxes. About 50 per cent of this is used in Ontario, 30 per cent in Quebec, and the remaining 20 per cent in British Columbia, Manitoba, New Brunswick and Nova Scotia. Less than one per cent is used in Alberta, Saskatchewan and Prince Edward Island, provinces where there are few manufactures and but little production of natural products requiring boxes for shipment.

Though Table I does not account for all the lumber used in the box industry, it is based upon replies from sufficiently numerous manufacturers in each province to indicate the species and average price of the lumber used.

Table II compares in each province the mill run price of the chief lumber used for boxes in that province with the prices paid for the same species of lumber by the box makers.

TABLE II.

Boxes and Box Shooks, 1909—The price of the chief Box Lumber used in each province compared with its average price at the saw mills of the province.

Province.	Chief Box Lumber.	Percentage it forms of total Box output.	Average sale price at mills of province. (1)	Average cost price at Box factories of province.
Quebec	Spruce	80·0 %	14·28	15·02
Ontario	Pine	67·5 %	22·33	14·97
British Columbia	Spruce	68·2 %	13·44	16·59
Manitoba	Pine	51·9 %	(2)	15·05
New Brunswick	Spruce	50·5 %	15·44	12·55
Nova Scotia	Spruce	80·0 %	11·98	11·19

[1] Bulletin 11—Forestry Branch.

[2] No white pine lumber is manufactured in Manitoba. The pine box lumber is imported chiefly from Ontario.

It is evident from a study of the prices given above that though boxes, because of the short life and light service usually expected of them, may safely be made of cull lumber and mill waste, this practice of utilizing low grades is not as common in Canada as it might profitably become.

In Quebec and British Columbia box lumber commands a higher average price than all other lumber, and in Nova Scotia the spruce used for boxes almost equals in price the spruce of all grades on the market. The only explanation of this is that in these three provinces, two of which, Quebec and British Columbia, are large producers of box lumber, cull lumber or waste material is not used for boxes. In Quebec four-fifths of the boxes are of spruce; there is little or no competition from other woods; the trade has become accustomed to clear spruce boxes, and though for the greater number of boxes manufactured cull lumber of several kinds would do—spruce, balsam, poplar or pine—this lumber is wasted and good grades of spruce are used. In British Columbia the waste of timber is more flagrant. Although only about 6 per cent of the lumber cut in British Columbia is spruce, two-thirds of the boxes manufactured are of spruce. Other woods suitable for box making in British Columbia are Douglas fir and hemlock, of which large enough quantities are wasted in the sawmills every month to manufacture all the boxes used in the province in a year. But the utilization of waste timber has not been developed in British Columbia; the buyers of boxes have been educated to demand a high grade article, and as a result British Columbia uses for boxes spruce which has been selected at $16.59 per thousand from a market upon which all grades of spruce average $13.44 per thousand.

The two provinces where waste timber is utilized for boxes are Ontario and Manitoba, where pine forms two-thirds and one-half respectively of the box timber manufactured. White pine is the box timber demanded by the trade in these provinces, and as white pine lumber of the better grades sells at too high a price to make it available, the box factories use a large proportion of culls and rough material—timber which would otherwise be wasted.

Pine is yet the only wood of which lower grades are utilized to any extent in the box business. Manufacturers of pine boxes buy their cull material at about $15 per thousand; manufacturers of spruce boxes can buy good spruce for the same price, and can thus produce a box of first-class spruce as cheaply as any one can turn out a box of cull pine. This fact tends to prevent the utilization of rough material or low grades of other species than pine, even though they may be well adapted for box manufacture.

In Table III are shown the quantities of lumber of each species used in box manufacture in 1909, the percentage each formed of the total, its total value and average value per thousand feet.

TABLE III.

Boxes and Box Shooks, 1909—Total Quantity, Per Cent Distribution, Total Value and Average Value, by species, of the Lumber manufactured for the Box Industry.

	Quantity.		Value.	
	Thousand Feet, B.M.	Per Cent Distribution	Total.	Average per M.
			$	$ c.
Spruce	43,034	52·7	651,133	15 15
Pine	24,781	30·3	373,878	15·09
Basswood (1)	3,329	4·1	57,555	17·29
Poplar	2,734	3·4	30,822	11·29
Hemlock	2,092	2·6	27,143	13·02
Maple	1,310	1·6	29,650	22·63
Douglas Fir	1,000	1·2	20,722	20·72
Balsam	895	1·1	8,785	9·82
Elm	733	0·9	10,739	14·65
Cedar	708	0·9	24,701	34·89
Ash	312	0·4	4,653	14·91
Gum	390	0·4	3,000	10·00
Oak	105	0·1	2,675	25·48
Birch	100	0·1	2,500	25·00
Beech	100	0·1	2,500	25·00
Butternut	70	0·1	1,340	19·14
Total	82,972	100	1,264,376	15·24

(1) Includes Cottonwood.

As well as supplying from 50 to 80 per cent of the box output of four different provinces, spruce furnishes over one-half of the entire consumption of box lumber in Canada; the only other wood used to a large extent is pine, which forms 30·3 per cent of the total. These two woods together account for five-sixths of the total; the remaining one-sixth is comprised of 14 different woods, of which basswood, poplar and hemlock are the chief.

The cheapest native woods used [illegible] balsam and poplar, which cost $9.82 and $11.29 per thousand respectively. Hem[illegible] and ash were the only other woods which cost less than spruce and pine, the staples. The hemlock was nearly all used in British Columbia.

Nearly 8 per cent of the basswood lumber cut in Canada is manufactured into boxes. In point of quantity basswood was eleventh in the 1909 list of lumber producing trees, but it was third in the list of timbers used for boxes. It is light, tough, odourless, and consequently a very popular box timber. It is much in demand for provision boxes and trunks. Other woods which find special uses in the box industry are spruce

and pine for salt and butter boxes; pine, spruce, cedar, balsam and butternut for tobacco boxes; poplar and cottonwood for egg and butter boxes; elm, maple, beech and birch for trunks, and pine for shoe boxes.

Two imported woods are used for boxes in Canada: Spanish cedar in the tobacco trade and gum for general purposes. The average price of gum was in 1909 only $10 per thousand. Very few veneered packages are manufactured in Canada.

It has already been mentioned that great economies might be effected if as large a proportion as possible of lower grades of lumber—resawn slabs and other mill waste—were used in the manufacture of all boxes as they are now used in the manufacture of pine boxes. There is another economy in forest utilization possible to the box industry, and that is the utilization of species which are not now desired for other purposes, especially western hemlock and different species of poplar. Experiments have been conducted by the United States forest service which showed that for large and medium boxes cottonwood is stronger per unit of weight than New England white pine, and that for small boxes both cottonwood and western hemlock are stronger per unit of weight than New England white pine. (W. K. Hatt in circular 47, U.S. Forest Service.)

The same experiments showed that western spruce, the favourite box material in British Columbia, is for large boxes stronger per unit of weight than New England white pine. In addition to these woods, there are in central and eastern Canada poplar and balsam fir, woods which are cheap, light in weight, light in colour, of even grain, odourless, tasteless, of handsome appearance and fairly strong, and should therefore be satisfactory for most classes of boxes.

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